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ABSTRACT

This study was designed to investigate the use of computers by student teachers in their practicums. Student teachers (n=120) in two public universities in the United States answered a questionnaire that covered: the manner and frequency of computer use, student teachers' perception of their training, their attitudes toward the role of the computer in teaching, and factors that might be associated with student teachers' use of computers. The study achieved a response rate of 92% (n=110). Eighty-five percent of the student teachers in the study reported using computers. Fifty-one percent of the student teachers used computers with children and for personal purposes. Student teachers held positive attitudes toward the role of computers in education. Drill and practice comprised the highest usage rate in educational software. There was a low usage rate in game, problem solving, tutorial, and simulation programs. Word processing had the highest usage rate of tool software, with usage rates sharply lower for graphics, spreadsheet, and database programs. While only 13% of the student teachers used computers for multimedia, just 10% of them used computers for telecommunication. Study findings highlight the need to restructure the educational computing courses in the teacher education programs at the two universities. (Contains 17 references.) (SWC)

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Student Teachers' Computer Use during Practicum

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Abstract. This study involved student teachers in the two public universities in the United States and was designed to investigate the use of computers by student teachers in their practicums: the manner and frequency of computer use, student teachers' perception of their training, their attitudes toward the role of the computer in teaching, and factors that might be associated with student teachers' use of computers. The study yielded both postive and negative results and pointed to the need of restructuring IT programs in the two univeristies.

Literature Review

Research indicates that school teachers make little use of computers (Sheingold & Hadley, 1990). Teachers often cite lack of computer skills as one of the major reasons for not using computers. To ensure that new generation of teachers will not simply add to the pool of teachers who need computer training once they are on job, teacher education programs in universities and colleges have started to offer educational computing courses in the hope that their newly-graduates will successfully implement the computer technology in teaching practice.

One of the goals of educational computing courses is to provide computer skills to preservice teachers. This approach makes sense considering the fact that often students enter teacher education programs with little or no computer skills. In Summers' study (1988), 74% of the first year students of elementary education majors had little or no previous computer experience. Reed, Ervin, and Oughton (1995) conducted a longitual study evaluating the computer experience of new entrants to a teacher education program. Their study showed that during a ten-year period from 1985 to 1994, there was an increase in computer experience from students who entered the program early and students who entered the program more recently. However, compared with English majors and mathematics education majors, elementary education majors had less computer experience and higher computer anxiety.

Another goal of educational computing courses is to foster positive attitudes among preservice teachers toward computers and develop their awareness of the value of the computer's role in education. One's attitudes toward computers play a significant role in the successful implementation of computers in educational settings (Koohang, 1987). Computer attitudes often refer to one's gut feelings toward the computer such as computer anxiety, one's opinion about the computer's role in teaching and learning, and one's perception of the adequacy of his/her training as a confident and competent computer user. Summers' study (1988) showed that 40% of students started college with negative feelings toward computers. Koohang's study (1987) demonstrated a positive relationship between one's computer attitudes and one's computer experience. His study (1987) also showed that students who had more computer experience had more positive attitudes toward the computer. The more computer experience a student had, the lower became his/her computer anxiety.

If one's computer attitudes can be influenced by one's computer experience, a computer training course can be used as an intervention in improving students' attitudes. Savenye and Orr's study (1992) described the effect of a computer training course on students' attitudes. The subjects in the study participated in a semester-long computer literacy course that significantly improved their attitudes.

However, Boone and Gabel's study (1994) issued a caution that computer training courses do not necessarily lead to positive attitudes toward computers. The subjects in their study (1994) were science education majors. The students' attitudes toward computers were monitored across a two-year period as they progressed through the teaching training program. During this period, the students had opportunities to take a three-credit-hour introductory computer course as a

part of degree requirement as well as other optional computer courses. The findings of the study indicate that the students' attitudes became less positive toward computer use. The implication of this research is that in order to facilitate positive attitudes, it is insufficient to merely offer students computer courses. What matters is the content of the course and how the course is taught. As Koohang found in his study (1987), the students' attitudes also relate to the nature of their computer experience.

When the students completed their computer training courses, what beliefs and values did they formulate regarding the computer's role in education? What were the students' perceptions of their preparation of computer use? Byrum and Cashman's study (1993) endeavored to answer these questions. Their study found that 83% of the students at six Midwest universities felt they were prepared to integrate computers into the curriculum. However, a detailed breakdown revealed that the majority of the students preferred using computers as a supplement to their teaching with drill and practice as their first choice. This indicates that these students did not break through the traditional view of the computer's role in education. The result was not a surprise since only 24% of the students had had a chance of developing lesson plans integrating computers outside computer training courses. The researcher emphasized the need of modeling the uses of computers for teaching and learning by faculty who teach education courses.

Even when students feel they are prepared for the computer use, will they use the computer once they are placed in classrooms? There is a sizable gap between the expected level of use by preservice teachers and the level of computer use by practicing teachers (Marcinkiewicz, 1994-1995). Practicing teachers had a much higher incidence of non computer use, compared to their preservice counterparts. The researcher attributed this to the fact that preservice teachers received computer training in their teaching training program. On the other hand, it might indicate that "future teachers' expectation of computer use will become lowered by external circumstances or those over which they have no control unless they are extraordinarily motivated" (p. 194). Both groups rated low in integrating the computer into the curriculum.

Marcinkiewicz's speculation (1994-1995) was confirmed by the experience of newly-graduates. Novak & Knowles (1991) and Oliver (1994) focused on beginning teachers' computer use and found that even when these teachers received training in computer use while they were in the program, their computer use rated low. These beginning teachers "were only able to utilize the computer in somewhat limited way" (Novak, 1991; p. 50). They viewed the computer as an extra activity rather then an integral part of the curriculum. "There is little evidence, however, that the teachers selected programs which provided relevant practice for the students. Many of the programs they used demonstrated weak instructional design and were only remotely related to the existing curriculum" (Novak, 1991; p. 48).

In Oliver's study (1994), a considerable number of beginning teachers were found not using computers even though in most schools, hardware and software access was not a problem. Those who had completed educational computing courses were no more likely to use the computer than those who had not. The researcher also found that the computer use patterns reflected the nature of the instructional programs. The primary beginning teachers made significantly more use of computers as an instructional aid due to their exposure to a curriculum that emphasized classroom implementation of the computer, whereas the secondary beginning teachers made more use of computers as a personal and management tool, which reflected their curriculum emphasis.

In summary, the review of the literature pointed to the fact that the nature, not the amount, of educational computing courses is the key factor determining the effectiveness of computer training of preservice teachers and influencing preservice teachers' future implementation of computers in educational settings.

In order to offer educational computing courses that cater to students' need, it is of vital importance to assess the effectiveness of the existing computer training courses so that these courses can be restructured to "embrace curriculum applications, strategies, and issues" (Oliver, 1994; p. 87).

The present study focused on student teachers' use of computers as an assessment of the effectiveness of the computer training in teacher education at two universities. The study focused on student teachers rather than on beginning teachers' use of computer because beginning teachers are under a tremendous amount of pressure trying to cope with their early days in the classroom. "Their computer use was notably impacted by their first-year status" (Novak & Knowles, 1991; p. 49). This pressure is lessened with student teachers for they can count on guidance and support from university supervisors and classroom cooperating teachers. Therefore, the data generated from investigation of their computer use during practicum reflect a truer picture of their computer training in teacher education.

The student teaching is a crucial period for student teachers. "It is in these experiences that education majors become acquainted with the realities of life in elementary and secondary classrooms, look for real-world connections to content presented in their university foundations and teaching methods classes, and develop their instructional and managerial skills" (Hunt, 1995; p. 37). Their experiences in this period help to shape their future teaching style. Consequently, it is important to investigate teaching practicums so that appropriate strategies can be developed to aid student teachers in integrating computers into their teaching.

However, the teaching practicum is an overlooked area in educational computing research. Few studies examine this crucial period in terms of student teachers' use of computers. Student teachers have been the focus of two recent studies. One was conducted by Dunn & Ridgway (1991a, 1991b) in the United Kingdom and one was conducted by Downes (1993) in Australia. Dunn & Ridgways' research (1991a, 1991b) focused on the pattern of the computer use among the practicum students. He conducted his research when the students completed their first teaching and final teaching respectively. Downes' research (1993) focused on student teachers' computer use with children and related factors affecting use. Up to date, no research has been located in the United States that focuses on student teachers' use of computers during their practicum.

This study involved student teachers in the United States and was designed to investigate the use of computers by student teachers in their practicums: the manner and frequency of computer use, student teachers' perception of their training, their attitudes toward the role of the computer in teaching, and factors that might be associated with student teachers' use of computers.

Background

Teacher education programs in the two public universities in this study shared similar characteristics. In both universities, elementary education majors are required to take a three-credit computers in education course. The course teaches computer literacy as well as classroom applications of educational software and tool software. The course is an option for secondary education majors. Students complete all the course work before they start a semester-long teaching practicum.

Methodology

The sample population consisted of all the practicum student teachers in two universities during the fall semester, 1995. The total sample population for this study was 120. A questionnaire was developed containing items related to each of the research questions. The questionnaire contained 23 questions including yes/no, multiple choice and Likert-type questions. The researchers distributed the questionnaires among supervising teachers and they, in turn, gave the questionnaires to the students they were supervising during the final week of the semester. One hundred and ten questionnaires were collected with a response rate of 92%.

Results

Background Information

Background information on the subjects included gender, age, prior computer experience, home computer ownership, and types of school where they did their student teaching. Background information is presented in table 1. As always the case among education majors, a great number of the subjects were females (80%). The majority of the students (69%) were ages 20-25. Students' computer experiences were varied. Surprisingly, about one fifths of the students (21%) had never taken any computer courses at the university level. Sixty-four percent of the students reported that they learned the computer in high school. Less than half of the students (45%) owned a home computer. Elementary schools were where most student teachers did their practicum (66%). Other types of schools (8%) referred to preschools, junior high or K-12 schools.

Table 1. Background Information

What is your gender?		
Male	n=22	20%
Female	n=88	80%
What is your age in years?		
20-25	n=76	69%
26-30	n=17	16%
30-35	n=5	5%
over 35	n=12	11%
Did you learn to use the computer in high school?		
Yes	n=68	64%
No	n=38	36%
How many computer courses have you had in the university?		
None	n=23	21%
One	n=51	46%
Two	n=18	16%
Over Three	n=18	16%
Do you own a personal computer?		
Yes	n=49	45%
No	n=59	55%
In what type of school did you student teach?		
Elementary	n=72	66%
Middle	n=5	5%
High	n=24	22%
Other	n=9	8%

School Computing Environment

The computing environment in practicum schools is shown in table 2. In most schools, computers were located in the computer lab (48%). Over half of the student teachers (56%) reported seeing their supervising teachers using the computer in the classroom. An overwhelming number of the students (83%) saw other teachers using computers in their practicum schools, an indication that computers are a common scene in schools.

Table 2. Computing Environment in Practicum Schools

How were computers placed in the school?		
one computer shared between classroom	n=5	5%
one computer in each classroom	n=14	13%
computers in a lab	n=53	48%
combination of above	n=33	30%
do not know	n=3	3%
Did you see your supervising teachers use the computer in the classroom?		
Yes	n=61	56%
No	n=49	44%
Did your supervising teacher talk to you about using the computers in the classroom?		
Yes	n=64	60%
No	n=42	40%
Did you see other teachers use computers?		
Yes	n=91	83%
No	n=19	17%
Did other teachers talk about using computers in their classroom?		
Yes	n=59	54%
No	n=36	46%

Computer Use during the Teaching Practicum

A high percentage of the students (81%) used computers during the practicum with 64% reporting their use was over 10 times (see table 3). Fifty-one percent of the students used the computer as a personal tool as well as with children as a classroom teaching tool.

Table 3. Computer Use during the Teaching Practicum

Did you use computers while student teaching?		
Yes	n=94	85%
No	n=16	15%
How often did you use computers (times)?		
Only once	n=1	1%
2-5 times	n=16	17%
6-10 times	n=17	19%
More than 10 times	n=60	64%
How did you use computers?		
personal use	n=29	31%
used with children	n=17	18%
used both personal and with children	n=47	51%

A detailed breakdown revealed that drill and practice was the most commonly used type of educational software (50%) with multimedia rating the lowest (13%). Word processing was the tool software used by most of the student teachers (67%) with database rating the lowest (11%). Only a small number of the student teachers used computers for telecommunication (10%).

Table 4. Types of Software Used during the Practicum

What types of educational software did you use while student teaching?		
drill and practice	n=55	50%
game	n=36	33%
problem solving	n=35	32%
tutorial	n=30	27%
simulation	n=17	16%
multimedia	n=14	13%
authoring		
What types of tool software did you use while student teaching?		
word processing	n=74	67%
graphics	n=40	36%
spreadsheet	n=15	14%
database	n=12	11%
telecommunication	n=11	10%

For those who did not use computers during the practicum, 9 students cited the major reason as a lack of access to hardware (45%), 7 students cited lack of access to software (35%) and 2 students mentioned that they lacked confidence or computer skills. The rest of the students did not respond to the question.

Table 5. Reasons for not Using Computers

If you did not use computers, why?		
lack of confidence	n=2	10%
lack of computer skills	n=2	10%
lack of access to hardware	n=9	45%
lack of access to software	n=7	35%

Student Teachers' Attitudes and Perception

The student teachers in this study had positive attitudes toward the role of the computer in education with 43% of the students considering it very important, 40% important and 17% somewhat important (see table 6). None of the students considered computers unimportant. Ninety-five percent of the students agreed or strongly agreed that computers improved their teaching effectiveness. Only 6% of the student teachers felt they were not prepared for computer use in future teaching. All of the students indicated that there was a chance that they were going to use computers in teaching if access to hardware and software were not a problem.

Table 6. Student Teachers' Attitudes and Perceptions

How important do you feel computers are in teaching?		
not important	n=0	0%
somewhat important	n=18	17%
important	n=44	40%
very important	n=47	43%
Do you agree that your teaching effectiveness is improved through the use of the computer?		
Strongly disagree	n=2	2%
Disagree	n=3	3%
Agree	n=62	62%
Strongly agree	n=36	33%
How well do you feel you are prepared to use computers?		
not prepared	n=6	6%
somewhat prepared	n=35	32%
prepared	n=39	36%
well prepared	n=29	27%
If hardware and software are available, how likely would you be willing to use the computer in your future teaching?		
not likely	n=0	0%
somewhat likely	n=16	15%
likely	n=31	28%
most likely	n=62	57%

Factors Associated with Computer Use

The present study found no gender difference in computer use. Male and female student teachers alike tended to use computers while student teaching (82% versus 82%) (see table 7). However, due to the imbalance of numbers between male (20%) and female (80%), a conclusion cannot be made. The student teachers who were in the 20-25 age group were most likely to use computers during the practicum (88%). Again, due to the imbalance of numbers in age groups, the relationship between age and computer use can not be determined. There was not much difference in computer use between those who learned computers in high school and those who did not. The percentage was close (82% versus 79%) in terms of computer use for both groups. The relationship between computer use and computer courses taken at university level is puzzling. The number of student teachers who used computers without taking any computer courses at university level was close to those who took three computer courses at university level (77% versus 79%). However, there was a high percentage of computer use among the student teachers who took two computer courses (89%) and those who took one computer course (82%). Ninety-two percent of student teachers who owned computers at home used them in the practicum compared to 73% who did not own a computer. Elementary school student teachers were most likely to use computers (84%). However, there were only 5 student teachers at middle school level. This fact needs to be considered in reaching a conclusion.

Table 7. Effect of Gender, Age, Computer experience, Home Computing and Types of Practicum Schools on the Use of Computers

			Use Computers during the practicum	
	n	percent	n	percent
Gender				
Male	22	20%	18	82%
Female	88	80%	70	82%
Age group				
20-25	76	69%	66	88%
26-30	17	16%	9	56%
30-35	5	5%	4	80%
Over 35	12	11%	9	75%
Learned computers in high school				
Yes	68	64%	54	82%
No	38	36%	30	79%
Computer courses taken at university level				
None	23	21%	17	77%
One	51	47%	41	82%
Two	18	16%	16	89%
Over Three	18	16%	14	78%
Personal computer ownership				
Yes	49	45%	45	92%
No	59	55%	43	73%
Types of schools while student teaching				
Elementary	72	66%	63	84%
Middle	5	5%	4	80%
High School	24	22%	18	75%
Others	9	8%	7	78%

When supervising teachers used computers or talked about computer use, approximately 95% of the student teachers used computers in the classroom (see table 8). Whereas, only 64% of them did so when the supervising teachers did not use or discuss computer use. When other teachers in the practicum school used or talked about computers, approximately 85% of the student teachers used computers and only 68% of them used computers when the other teachers did not use or discuss computer use. For those who thought computers were very important or important in teaching, approximately 87% used computers in their practicum, whereas only 61% did so when they thought computers were somewhat important (see table 9). Among the student teachers who strongly agreed that their teaching effectiveness was improved by the use of computers, 94% of them used computers, compared with 67% of computer use among those who disagreed. Two students strongly disagreed that computer use improved their teaching effectiveness. Both of them used computers while student teaching. However, both students considered computers important in teaching. Ninety-one percent of the student teachers

reported computer use in schools where computers were placed both in the lab and in the classroom, while 78% of the student teachers reported using computers in schools where computers were placed only in the lab. However, the placement of a computer in a classroom did not guarantee computer use. Four student teachers did not use computers even they reported they had a computer placed in their classroom. Five students reported that computers were shared between classrooms. All five students used computers during their practicum.

Table 8. Effect of Computing Environment in Practicum Schools on Computer Use

				Use computers during the practicum	
		n	percent	n	percent
Supervising teacher's use of computers	Yes	61	56%	58	95%
	No	49	44%	30	61%
Supervising teacher talk about the use of computers	Yes	64	60%	60	94%
	No	42	40%	26	62%
Other teachers' use of computers?	Yes	91	83%	76	84%
	No	19	17%	12	63%
Other teachers' talk about using computers	Yes	59	54%	51	86%
	No	36	46%	24	67%

Placement of computers in practicum schools	n	percent	n	percent
One computer between classrooms	5	5%	5	100%
One computer in each classroom	14	13%	10	72%
Computer lab	53	48%	40	78%
Combination of the above	33	30%	39	91%

Table 9. Effect of Student Teachers' s Attitude and Perception

			Use Computers during the practicum	
	n	percent	n	percent
How important do you feel computers are in teaching?				
Very important	7	43%	40	87%
Important	44	40%	37	86%
Somewhat important	18	17%	11	61%
Not important	0	0%	0	0%
Was your teaching effectiveness improved by computer use ?				
Strongly disagree	2	0%	2	100%
Disagree	3	15%	2	67%
Agree	62	28%	50	76%
Strongly agree	36	57%	33	94%

Discussion

This study yielded both positive and negative results. The student teachers in this study had a higher percentage of computer use than those in Dunn & Ridgway's study (1991b) and Downes' study (1993). Eighty-five percent of the student teachers in this study reported using computers, compared with 71% of computer use by those in Dunn & Ridgways' study. More student teachers used computers with children compared with those in Downes' study (1993). Fifty-one percent of the student teachers used computers with children and for personal purposes, whereas, only 20% of the student teachers did so in Downes' study (1993).

Student teachers held positive attitudes toward the role of computers in education. Teachers' attitudes are of vital importance in the successful implementation of computers in educational settings (Koohang , 1987). Student teachers in this study acknowledged the value of computers in education and were willing to implement computers in their future teaching.

However, the discovered pattern of computer use was far from satisfactory. Drill and practice comprised the highest usage rate in educational software. There was a low usage rate in game, problem solving, tutorial and simulation. Word processing had the highest usage rate of tool software. The usage rate dropped sharply for graphics, spreadsheet and database. While only 13% of the student teachers used computers for multimedia, just 10% of them used computers for telecommunication. This pattern of computer use suggested that these students were only being prepared for computer use in a limited way. Even though most of them considered themselves prepared, there was a discrepancy between their perception and reality.

The findings of the study pointed to the need of restructuring the educational computing courses in teacher education at the two universities. At the present time, only one educational computing course is offered in teacher education at both universities. The course is a mixed approach of computer literacy and computer classroom applications. However, since students usually entered the course with little computer experience, they spent most of the class time learning how to operate the machine. Computer applications in teaching comprised only a

small segment of the course. The course might get students to the level of utilizing computers as a personal production tool, but not to the level of integrating computers into classroom teaching. We cannot assume that once students know how to use the computer, they will ultimately implement it in classroom teaching. Integrating computers into teaching is a complex process and students need to go through thorough training to develop necessary skills and strategies.

Therefore, there is a need for a course focusing on strategies in applying computers to classroom teaching. However, the mere offering of the course will not achieve the goal. Research shows that the key factor affecting computer use is the nature of the course. Educational computing courses should cater to students' needs and aim at preparing students for implementing computers in real classroom settings.

Educational computing courses need to present students with examples and models of computer use in real classroom settings. "Our challenge is to provide a clear vision of how computers and technology can transform classroom instruction" (Wetzel, 1993; p. 335). Whenever possible, instructors should invite classroom teachers to demonstrate their experience of integrating computers into the curriculum. Not only should students learn how to teach by using the computer, they also need to experience learning the course content by using computers themselves as learners to feel the impact of the computer as a powerful learning tool. Whenever appropriate, instructors should present course materials by using computers themselves to model the computer's role as a teaching tool. "Teacher educators will do well to model the use of computers in instruction so as to provide realistic examples from which these future teachers can later build" (Novak & Knowles, 1991; p. 49).

Computers will not exert a powerful influence if their use is confined to only educational computing courses. Computers need to be integrated across the curriculum in teacher education programs. Instead of utilizing computers only in educational computing courses, students should be both encouraged and required to use the computer outside the educational computing courses. This requires the cooperation and communication among faculty members in planning and offering courses. Faculty training workshops and seminars are essential in the program planning so that faculty can develop appropriate attitudes and necessary skills to accomplish the goal.

In order to bridge the gap between the university classroom and the real world, teacher education programs should make efforts to seek connections with the real world. Field experience offers such a connection and should be an integrated component in educational computing courses. For example, opportunities should be created for students to visit school computer labs and observe computer usage in real classroom situation.

The teaching practicum offers both intensive and extensive field experience. Since this period is crucial in shaping student teachers' future teaching styles, technology should be made an integrated part of this experience. Dugdale (1994) reported a positive experience integrating computers into student teaching. The students were required to design classroom-based projects and implement their projects in the classroom setting while they were student teaching. This study shows that student teachers tend to role model their supervising teachers. It would promote student teachers' use of computers if they were assigned to supervising teachers who use computers in classroom teaching. Since other teachers might also have influence on student teachers, the entire school environment should also be taken into consideration for assigning practicum students in order to maximize computer use in instruction.

Teacher education programs should consider developing plans to train school teachers to help create and maintain an encouraging and supportive practicum environment to utilize computers in instruction. "Professional development is necessary for everyone in education to keep them up to date and refresh their approach (Davis, 1993; p. 239). Often, the cooperating classroom teachers lack appropriate attitudes or necessary computer skills to be supportive of student teachers' use of computers (Hunt, 1995). Davis (1993) quoted a promising model of providing in-service training to practicing teachers. The training was conducted at the school site and involved both practicing teachers and student teachers. Practicing teachers and students teachers took turns receiving training and then taking care of the class when the other one was receiving the training. Sometimes, the trainer was one of the practicing teachers or one of the student teachers.

Home computer ownership is an important factor influencing the use of computers. This might be due to the fact the home ownership provides opportunities for the students to practice their computer skills. Some universities have made it an requirement that every student purchase a personal computer. It is speculated that such a requirement, in the long run, could help increase the computer literacy of students and promote the use of computers in teaching and learning.

Conclusion

This study focused on student teachers at two universities in the United States and provided an insight into the student teachers' use of computers during the practicum and factors associated with the use. The findings of the study highlighted the need to restructure the educational computing courses in the teacher education programs at these two universities.

"An essential part of integrating technology into the educational curriculum is the training of persons who will ultimately use the technology" (Byrum & Cashmen, 1993; p259-260). Teacher education programs need to consider infusing technology into student teaching, the crucial period in students' professional development, so that students will be better prepared to implement computers in real classroom settings.

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